IDS-7

DERWENT-ACC-NO: 1992-374655

DERWENT-WEEK: 199246

TITLE: Converting refuse derived fuel into combustible gas - involves riddling gasification ashes, mixing with fines from sleeve filters and using as catalysts in catalytic cracking process

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PRIORITY-DATA: 1991IT-UD00074 (May 8, 1991)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
EP 512305 A1	November 11, 1992	E	006	C10B 053/00
DE 69203035 E	July 27, 1995	N/A	000	C10B 053/00
EP 512305 B1	June 21, 1995	E	007	C10B 053/00
ES 2073807 T3	August 16, 1995	N/A	000	C10B 053/00
IT 1248156 B	January 5, 1995	N/A	000	C01F 000/00
US 5262577 A	November 16, 1993	N/A	004	C07C 001/00

DESIGNATED-STATES: AT BE CH DE DK ES FR GB GR LI NL PT SE AT BE CH DE DK ES FR GB GR LI NL PT SE

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APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
EP 512305A1	N/A	1992EP-0106741	April 21, 1992
DE 69203035E	N/A	1992DE-0603035	April 21, 1992
DE 69203035E	N/A	1992EP-0106741	April 21, 1992
DE 69203035E	Based on	EP 512305	N/A
EP 512305B1	N/A	1992EP-0106741	April 21, 1992
ES 2073807T3	N/A	1992EP-0106741	April 21, 1992
ES 2073807T3	Based on	EP 512305	N/A
IT 1248156B	N/A	1991IT-UD00074	May 8, 1991
US 5262577A	N/A	1992US-0879579	May 7, 1992

INT-CL (IPC): C01F000/00, C07C001/00 , C10B053/00 , C10J003/64

ABSTRACTED-PUB-NO: EP 512305A

BASIC-ABSTRACT:

The refuse derived fuel is gasified and the derived gas undergoes a process of catalytic cracking in which at least one alkaline additive or an equiv. prod. is used. The gas is passed through a cyclone separator to collect the particulate solids and thereafter undergoes a cooling process with recovery of hot air before being passed through sleeve filters. The ashes of gasification are riddled beforehand to gather the fines, which are mixed with fines coming from the sleeve filters and are employed as further catalysts in the catalytic cracking process.

Pref. in the refuse derived fuel, part of the ashes gathered from the bottom of the gasification furnace and the ashes sepd. by the system of filter sleeves installed on the line of the gas downstream of the heat exchangers are recycled and not sent directly to the disposal dump. The fine fraction of the ashes from the bottom of the gasification furnace and the ashes gathered by the sleeve filter system are mixed with a suitable alkaline additive to generate the catalyst mixture to be sent to the cracking step. This mixture, which acts as a catalyst for the reaction that takes place during catalytic cracking, can be sent to the cracking reactor. In this way the quantity of catalyst to be fed to the cracking reactor is reduced considerably with resulting financial advantage for the process of treatment of the gas.

USE - A method to convert refuse derived fuel, whether of an urban or industrial origin into a combustion gas

ABSTRACTED-PUB-NO: EP 512305B

EQUIVALENT-ABSTRACTS:

Method to convert refuse derived fuel (RDF) into a combustible gas, whereby the refuse derived fuel is gasified and the derived gas undergoes a process o catalytic cracking in which at least one alkaline additive is used, the resulting gas being passed through a cyclone separator to collect the particulate solids and thereafter undergoing a cooling process with recovery of hot air before being passed through sleeve filters, the ashes of the gasification and the particulate solids being sent to a dump for ashes, the method being characterised in that the ashes of gasification are riddled beforehand to gather the fines, which are mixed with fines coming from the sleeve filters and are employed as further catalysts in the catalytic cracking process.

US 5262577A

Converting refuse-derived fuel (ROF) into a combustible gas comprises gasifying the fuel in a furnace, sepg. the gas and ashes, catalytically cracking the gas in which at least one alkaline additive is used, passing the gas from a cracking step through a cyclone separator to collect particulate solids, cooling the gas from the separator with a recovery of hot air, passing the gas through bag filters, transferring the ashes and particulate solids to a dump, sieving the ashes to gather fines, and mixing fines from the ashes of gasification with fines recovered from the bag filters and adding the mixt. to derived gas as catalysts.

ADVANTAGE - Ashes can be sepd. from the gaseous prods. and so it is possible to reduce vol. of equipment required to treat gaseous prods.

CHOSEN-DRAWING: Dwg.0/1 Dwg.0/1 Dwg.0/1

TITLE-TERMS: CONVERT REFUSE DERIVATIVE FUEL COMBUST GAS RIDDLE GASIFICATION ASH MIX FINE SLEEVE FILTER CATALYST CATALYST CRACK PROCESS

DERWENT-CLASS: H04 H09

CPI-CODES: H09-F02;

SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: C1992-166234

PUB-NO: EP000512305A1

DOCUMENT-IDENTIFIER: EP 512305 A1

TITLE: Method to convert refuse derived fuel into a combustible gas.

PUBN-DATE: November 11, 1992

INVENTOR-INFORMATION:

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NAME	COUNTRY
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APPL-NO: EP92106741

APPL-DATE: April 21, 1992

PRIORITY-DATA: IT00UD910074A (May 8, 1991)

INT-CL (IPC): C10B053/00 , C10J003/64

EUR-CL (EPC): C10B053/00 , C10J003/64

ABSTRACT:

CHG DATE=19990617 STATUS=O> Method to convert refuse derived fuel (RDF) into a combustible gas, whereby the refuse derived fuel is gasified and the derived gas undergoes a process of catalytic cracking in which at least one alkaline additive or an equivalent product is used, the gas being passed through a cyclone separator to collect the particulate solids and thereafter undergoing a cooling process with recovery of hot air before being passed through sleeve filters, the ashes of the gasification and the particulate solids being sent to a dump for ashes, the ashes of gasification being riddled beforehand to gather the fines, which are mixed with fines coming from the sleeve filters and are employed as further catalysts in the catalytic cracking process. 

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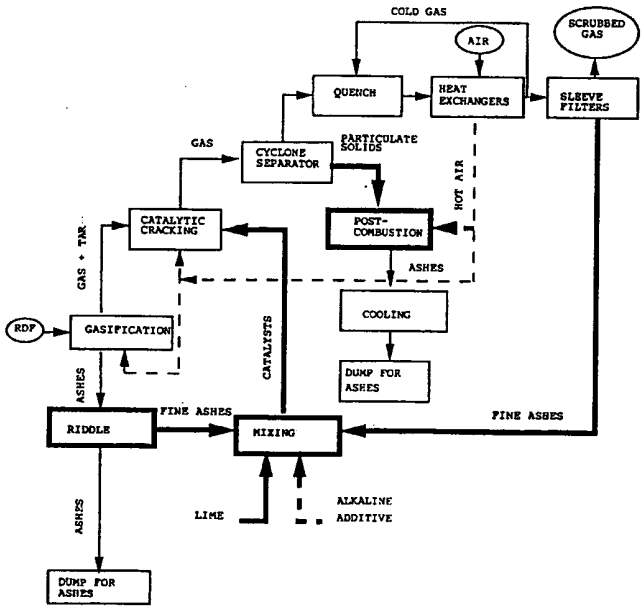
(54) **Method to convert refuse derived fuel into a combustible gas.**

(57) Method to convert refuse derived fuel (RDF) into a combustible gas, whereby the refuse derived fuel is gasified and the derived gas undergoes a process of catalytic cracking in which at least one alkaline additive or an equivalent product is used, the gas being passed through a cyclone separator to collect the particulate solids and thereafter undergoing a cooling process with recovery of hot air before being passed through sleeve filters, the ashes of the gasification and the particulate solids being sent to a dump for ashes, the ashes of gasification being riddled beforehand to gather the fines, which are mixed with fines coming from the sleeve filters and are employed as further catalysts in the catalytic cracking process.



EP 0 512 305 A1

This invention concerns a method to convert refuse derived fuel, whether of an urban or industrial origin, into a combustible gas, as set forth in the main claim.

The method of the invention is applied adantageously, but not only, to the processes of gasification and/or pyrolysis of conventional solid fuels or fuels derived from the screening of solid urban refuse or from the processing of biomasses.

The gasification technology which has been developed for some time now for the production of gas from coal or wood has been used recently with more difficult fuels, such as the p residues of the processing of biomasses, solid urban refuse, and solid industrial refuse or the combustible fraction derived therefrom and conventionally called refuse derived fuel.

This technology is worthwhile since it enables the ashes to be separated from the gaseous products, which have a smaller volume than the products resulting from simple incineration, and therefore makes possible a reduction of the volumes of the equipment required to treat the products and a more efficient technique for the combustion.

Moreover, the various available technologies give birth to a gaseous mixture consisting essentially of light gases such as CH_4, CO, H_2, H_2O, N_2 and CO_2, but also of a moderate quantity of vapours of high-boiling hydrocarbons (tars) and of ashes containing volatile metals.

The energy content of the tars amounts to about 20% of the calorific power of the gas produced and is therefore an important fraction for the yield of heat of the process.

The chemical-physical properties of these products make problematical the employment of the gas produced in traditional usage equipment such as boilers or gas-powered engines since the gas produces harmful emissions and also deposits along the pipes and in the equipment.

It is therefore worthwhile to recover and convert these products into a usable form.

One of the most promising ways has been found to be catalytic cracking.

In the state of the art the gasification process and the successive treatment to scrub the gas thus produced comprise according to the state of the art the following steps:

- the feeding of refuse derived fuel into a gasification furnace with a controlled quantity of oxidizing gas;
- discharge of the residual ashes from the bottom of the furnace;
- extraction of the gas thus produced from the top of the gasification furnace, the gas consisting mainly of CH_4, CO, H_2, H_2O, N_2, CO_2 and of hydrocarbons with a wide boiling-point spectrum (tars);
- catalytic cracking of the tars and ammonia by the addition of a controlled quantity of a high-temperature oxidising gas (air, for instance) and of a catalytic support (dolomite, for instance);
- neutralisation of the hydrogen-halogen acids, mainly hydrochloric acid and hydrogen sulphide, contained in the gas by means of adsorption on beds of dolomite;
- separation of part of the entrained particulate solid after the cracking step, in a cyclone chamber or another suitable separator;
- cooling the gas by mixture with low temperature (quench) recirculated gas or by atomised water;
- cooling the gas in heat exchangers with a simultaneous pre-heating of process air to be used for the gasification and catalytic cracking;
- final scrubbing of the gas by filtration through sleeves of fabric;
- combustion of the gaseous mixture containing only light fractions, such as CH_4, CO, H_2, H_2O, N_2 and CO_2, and therefore suitable for subsequent employment in technical usage apparatus devoid of final treatment of fumes, such as endothermic engines, boilers, heating furnaces, etc.;
- the ashes from the the gasification furnace, catalytic cracking reactor and systems to filter the gas thus produced are sent to appropriate controlled dumps.

The combustion of the gas obtained by this treament produces fumes with a reduced corrosive action and a lower content of harmful products such as dioxin, NO_2 and acid products derived from the heating of hydrogen-halogen products present in the refuse derived fuel.

The present applicant has studied, tested and brought about this invention so as to obviate the shortcomings of the state of the art and to achieve further advantages.

The invention is set forth and characterized in the main claim, while the dependent claims describe variants of the idea of the main solution.

The attached figure shows as an example a block diagram of the cyle according to the invention.

In the process of gasification of the refuse derived fuel according to the invention a part of the ashes gathered from the bottom of the gasification furnace and the ashes separated by the system of filter sleeves installed on the line of the gas downstream of the heat exchangers are recycled and not sent directly to the disposal dump.

The ashes from the bottom of the gasification furnace are rich in residual alkalinity and, according to the invention, are riddled and divided into a fine

fraction (smaller than 2-3 mm.) and a coarse fraction intended for dumping.

The fine fraction of the ashes from the bottom of the gasification furnace and the ashes gathered by the sleeve filter system are mixed with a suitable alkaline additive, or an equivalent product, so as to generate the catalyst mixture to be sent to the cracking step.

This mixture, which acts as a catalyst for the reaction that take place during catalytic cracking, can be sent to the cracking reactor, for instance by a pneumatic conveyor.

In this way the quantity of catalyst to be fed to the cracking reactor is reduced considerably, with a resulting financial advantage for the process of treatment of the gas itself.

According to the invention a suitable quantity of lime or of an equivalent product to abate the chlorine content is introduced into the cycle together with the ashes.

According to the invention the ashes and the lime are introduced into the cycle in the gas line upstream of the catalytic cracking reactor so as to accomplish a reduction of unburnt material and a partial recovery of energy.

In this way, besides the financial advantage of a greater yield of the gasification process, there is also an environmental advantage resulting from the reduction of the solid effluent to be sent for dumping.

Moreover, during the gasification process according to the invention the gas leaving the catalytic cracking reactor undergoes a step of separation, by means of a cyclone separator for instance, before being cooled.

The particulate solid thus gathered undergoes a postcombustion treatment with preheated air at a high temperature.

The heat generated by this postcombustion is used directly to complete the catalytic cracking reactions.

The mass of recirculated ashes consists, for the most part, of activated carbon, which in the established cracking conditions is converted efficiently, by means of reaction with the water vapour present, into oxides of carbon and hydrogen, thus increasing the yield of combustible gases.

Moreover, in the method according to the invention the recirculated ashes contribute towards keeping the cracking conditions stable and homogeneous and increasing the heat exchange during the subsequent treatment steps.

The quantity of recirculated ashes can be regulated suitably, and also automatically, so as to keep the operational cracking conditions stable and thus to lessen the problems due to fluctuations, even sudden fluctuations, in the characteristics of the gas produced in the previous gasification syep.

The operational conditions of the postcombustion enable residual ashes to be obtained with a minimum content of unburnt material and with an efficient thermal destruction of harmful organic carbonous products.

This postcombustion of unburnt ashes takes place advantageously, but not necessarily, in an appropriate chamber located below the discharge of the cyclone separator.

In this way the residual solids of the postcombustion step consist of inert materials and represent the only solid effluent of the treatment cycle together with the coarse ashes from the bottom of the gasification furnace.

The quantity of this solid effluent of the cycle amounts to about 8% to 10% by weight of the burnt refuse derived fuel.

In this way, besides the reduction of the unburnt material, there is also a partial recovery of energy, which increases the yield of the gasification process and makes the process still more worthwhile financially.

Claims

1. Method to convert refuse derived fuel (RDF) into a combustible gas, whereby the refuse derived fuel is gasified and the derived gas undergoes a process of catalytic cracking in which at least one alkaline additive or an equivalent product is used, the gas being passed through a cyclone separator to collect the particulate solids and thereafter undergoing a cooling process with recovery of hot air before being passed through sleeve filters, the ashes of the gasification and the particulate solids being sent to a dump for ashes, the method being characterized in that the ashes of gasification are riddled beforehand to gather the fines, which are mixed with fines coming from the sleeve filters and are employed as further catalysts in the catalytic cracking process.

2. Method as claimed in Claim 1, in which the alkaline additive or an equivalent product is added during the step of mixing the fines.

3. Method as claimed in Claim 1 or 2, in which lime or an equivalent product is added during the step of mixing the fines.

4. Method as claimed in any claim hereinbefore, in which the particulate solids leaving the cyclone separator undergo a postcombustion step.

5. Method as claimed in any claim hereinbefore,

in which the hot air recovered by the cooling is employed for the operation of postcombustion of the particulate solids leaving the cyclone separator.

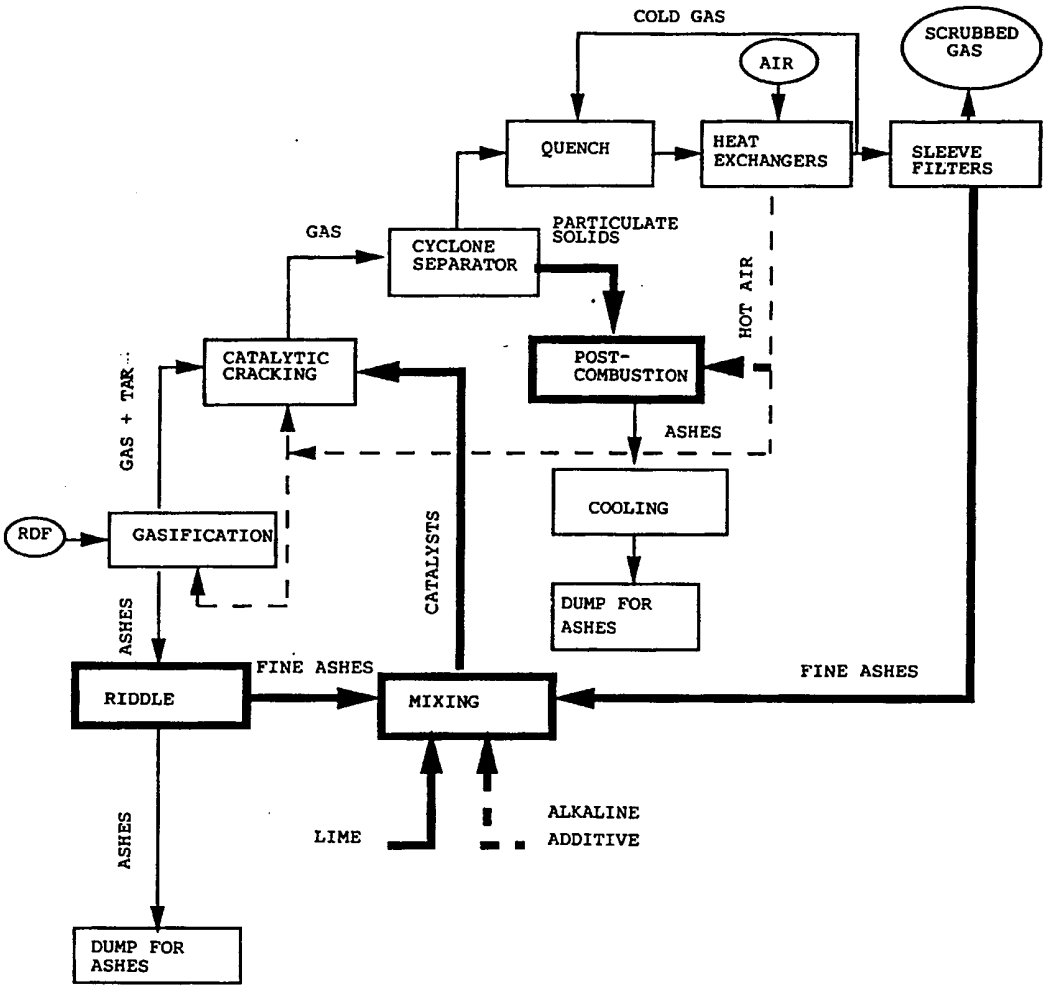
6. Method as claimed in any claim hereinbefore, in which the postcombustion of the ashes produces heat used directly to complete the catalytic cracking reactions.

7. Method as claimed in any claim hereinbefore, in which the mass of recirculated ashes consists, for the most part, of activated carbon which in the established cracking conditons is converted efficiently, by reaction with the water vapour present, into oxides of carbon and hydrogen, thus increasing the yield of the combustible gases.

8. Method as claimed in any claim hereinbefore, in which the recirculated ashes contribute towards keeping the cracking conditions stable and homogeneous and towards increasing the heat exchange in the subsequent treatment steps.

9. Method as claimed in any claim hereinbefore, in which the quantity of recirculated ashes can be regulated suitably, and also automatically, in such a way as to keep the operational cracking conditions stable, thus lessening the problems due to fluctuations, even sudden fluctuations, in the characteristics of the gas produced in the previous gasification step.

10. Method as claimed in any claim hereinbefore, in which the operational conditions of the postcombustion enable residual ashes to be obtained with a minimum content of unburnt material and with an efficient thermal destruction of harmful organic carbonous products.


COLD GAS
AIR
SCRUBBED GAS
QUENCH
HEAT EXCHANGERS
SLEEVE FILTERS
GAS
CYCLONE SEPARATOR
PARTICULATE SOLIDS
HOT AIR
CATALYTIC CRACKING
POST-COMBUSTION
GAS + TAR
ASHES
COOLING
RDF
GASIFICATION
CATALYSTS
DUMP FOR ASHES
ASHES
FINE ASHES
FINE ASHES
RIDDLE
MIXING
ASHES
LIME
ALKALINE ADDITIVE
DUMP FOR ASHES

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 10 6741

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	FR-A-2 385 037 (LEMBOURG) * page 7, line 36 - page 8, line 7; claims 1,7,8,12,25,26; figure 1 * ---	1-10	C10B53/00 C10J3/64
A	WO-A-8 809 364 (MUNCK AF ROSENSCHÖLD) ---		
A	EP-A-0 152 912 (KIENER PYROLYSE) -----		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

C10B
C10J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 AUGUST 1992	MEERTENS J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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